2022

MIT MOBILITY INITIATIVE
ANNUAL REPORT

LEADING THE TRANSORMATION TOWARDS TOMORROW'S MOBILITY SYSTEM

MIT MOBILITY INITIATIVE

MIT MOBILITY **INITIATIVE**

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MIT MOBILITY INITIATIVE
VISION & MISSION

Strong, multi-disciplinary leadership in the field is more essential than ever as communities and cities face both immense opportunity and immense uncertainty.

Anantha Chandrakasan, Dean, MIT School of Engineering

The future of mobility is at our doorstep and we have all of the tools we need to seize it, but they require thoughtful and effective stewardship.

Hashim Sarkis, Dean, MIT School of Architecture and Planning

VISION

The global mobility system is undergoing profound transformation. An unprecedented combination of new data and technologies (autonomy, electrification, and AI) is colliding with new and evolving priorities and objectives (decarbonization, public health, and social justice). The timeframe for these changes – decarbonization in particular – is short in a system with massive amounts of fixed, long-life assets and entrenched behaviors and cultures.

The MIT Mobility Initiative (MMI) was founded as a global resource to accelerate the transformation to a mobility system that is safe, clean and inclusive. MMI convenes key stakeholders in order to drive decarbonization and innovation forward while providing strategic guidance to navigate today's challenges.

MISSION

To achieve its Vision, the Mobility Initiative aggregates all transportation-related research at the Institute, engages a rich industrial and public sector ecosystem, and **conducts activities across four key pillars**: Research, Education, Entrepreneurship, and Civic Engagement. This annual report will present highlights across each of the four pillars. For more information, visit the MIT Mobility Initiative's website: mmi.mit.edu.

Research
Cross-disciplinary research projects & data-driven analysis

Education
Home to MIT's mobility-related graduate programs

Entrepreneurship
Home to MIT's mobility innovation ecosystem

Civic Engagement
Collaboration with communities to drive real-world deployment

CORE VALUES

SYSTEMS THINKING
Integrating all parts

Transportation is inherently a complex system, requiring an array of tools and methodologies to explore its constituent parts. The MMI approaches the analysis of key areas such as autonomy, connectivity, multimodal integration, electrification, and more with a systems lens in order to design efficient & robust systems and networks.

ECOSYSTEM ENGAGEMENT
Engaging the front lines

The future of mobility is shaped within a complex and highly dynamic ecosystem of startups, established transportation companies, Big Tech, and government at all levels. The MMI recognizes the importance of engaging with business and government leaders who are on the front lines of the mobility revolution.

CROSS-DISCIPLINARY RESEARCH
Creative knowledge development

With an array of new tools and methodologies emerging across a wide array of disciplines, a cross-disciplinary approach encourages researchers to confront new and more intricate questions, while opening up new areas of research. The MMI strives to promote creative and interdisciplinary methods and approaches.

ENTREPRENEURSHIP
Centering innovation

Leading US universities in startup creation and patents issued, MIT has cultivated a rich and mature innovation mobility ecosystem with a long history of successful spin-off startups. The MMI places innovation & entrepreneurship front and center in its efforts to build a system that is safe, clean, and inclusive.

MIT MOBILITY INITIATIVE

MESSAGE FROM **THE DIRECTOR**

MIT has a long and proud history in transportation research and education. Far from launching the Institute's first transportation course or initiating its first mobility-related research project, the Mobility Initiative was built upon a strong foundation of on-going research efforts and coursework from across the Institute.

The first year of the Mobility Initiative was thus focused on building community. The Initiative brought together MIT's vast resources in this space and captured their inherent cross-disciplinary richness. We set up numerous fora for exchange, including our widely successful weekly Mobility Forum series, built an intellectual framework to organize on-going research, and reframed the educational requirements for our graduate degrees to better address the needs of tomorrow's transportation system.

This second year of the Initiative has been focused on building our agenda. The broad domain of transportation and mobility is the focus of substantial resources and major challenges as never before. Meanwhile, communities and cities are uncertain about their mobility future, while facing the daunting pressures of climate change. There is a clear need, as well as a great opportunity for MIT to take leadership in this domain.

We have had a rich and busy year, working to engage external partners and stakeholders from across the mobility ecosystem to understand the challenges they face and emerging opportunities within their fields of action. We have leveraged the strong foundation of on-going research to bolster public sector efforts in a wide array of areas, including electric vehicle charging, transit agency recovery efforts, supply chain disruptions, and more. And we have coalesced the insights gleaned from all of the above into a coherent and high-priority research agenda lying at the intersection of disciplines.

A key element of establishing a successful Initiative is building a strong team. I have been delighted by the commitment of a large corps of MIT faculty members to the Initiative's purpose and the challenges presented by today's evolving mobility landscape. We have also added a strong cadre of industrial members to the group this year, representing a core pillar of effective action in the mobility space. And it is my distinct pleasure to have built out the Initiative's leadership into a core team with diverse skills and a strong commitment to the Initiative's mission.

As we look towards our third year, there is little holding us back. We are excited to embark on our new research agenda, to expand our activities in entrepreneurship, to further engage the public and private sectors, and to work towards a mobility system that is safe, clean, and accessible.

JINHUA ZHAO
Director, MMI

MIT MOBILITY INITIATIVE

MESSAGE FROM THE **EXECUTIVE DIRECTOR**

This is the world's mobility moment.

Technology is advancing our quest for autonomous mobility. New business partnerships between mobility providers and non-transportation businesses, some previously unthinkable, are announced on a weekly basis. The transformation to an electrified mobility system is reaching a tipping point. Cities are rethinking what their streets should look like.

The future of mobility is shaped within a dynamic ecosystem of established transportation companies, Big Tech players, and an explosion of startups. Government regulators and policymakers often struggle to keep up with the changes. For the MIT Mobility Initiative to achieve our goals, we must be deeply connected and integrated into this dynamic mobility ecosystem.

The MIT Mobility Initiative offers a platform to shape the future of mobility systems with a view toward three simple objectives: safe, clean and inclusive mobility. The Initiative leverages resources across the Institute – particularly the 70+ faculty who are engaged in research and scholarship related to transportation – to deliver rigorous, independent insight into key questions.

Established in 2020 under the leadership of Professor Jinhua Zhao, the MIT Mobility Initiative achieved several accomplishments in 2021 related to our four pillars of research, education, entrepreneurship and civic engagement:

- We were pleased to welcome our first three corporate members: Hyundai Motor Group, Ferrovial and Intel.
- We started to build our research agenda with an initial focus on autonomous and connected mobility and electric vehicle charging infrastructure.
- We hosted our first MIT Mobility Initiative Vision Day attracting over 130 participants – including over 40 CEOs, Founders and C-Suite business executives.
- We organized a workshop on transit recovery to Covid 19, produced an MOU on supply chain responses for the US National Economic Council, and conducted a Mobility Equity Symposium.
- We enhanced the MIT transportation curriculum (particularly with new courses like Decarbonizing Urban Mobility) and improved the Masters and PhD applicant pools.

MIT can and will provide an important contribution to shape this mobility moment. This is the opportunity that excited and motivated me to join as Executive Director in July 2021 and, with Faculty Director Jinhua Zhao and Assistant Director Annie Hudson, to build a global resource. We look forward to growing our community of business leaders, technologists, policymakers, strategist, researchers, faculty, students – the people that are the foundation for achieving meaningful impact toward a mobility system that is safe, clean and inclusive.

JOHN MOAVENZADEH

Executive Director, MMI

MMI COMMUNITY & EVENTS
MOBILITY VISION DAY

Setting a research agenda for the future of transportation

On November 16th, 2021, the Mobility Initiative hosted its first annual Mobility Vision Day. 131 invitation-only participants engaged in a rich and highly interactive series of discussions to shape the research agenda around five key topic areas: autonomy, connectivity, electrification, data, and equity.

The first annual MMI Mobility Vision Day packed a large punch with rich discussion, new connections, and deep insights. The event saw nearly 100 attendees in person and 37 joining virtually. 21 percent of attendees were CEOs or founders and all attendees had been carefully chosen to represent key perspectives and actively engage in an event with a clear purpose: to identify today's most pressing mobility challenges and develop a research agenda that can help move today's mobility system towards a future that is safe, clean, and inclusive.

The morning keynote panel eloquently set the tone for the day featuring Hyundai's President and Chief Innovation Officer YoungCho Chi, Transport for London's Chief Technology Officer Shashi Verma, Mobileye Executive Vice President Erez Dagan, Cintra CEO Andres Sacristan, and Ford Fund President Mary Culler. Panelists discussed the importance of approaching mobility as a full system rather than tackling individual challenges in isolation.

A series of rich discussions followed: each of the five core topics--autonomy, connectivity, electrification, data sharing, and equity--first featured panel presentations followed by discussions on the panel content among all participants (centered at each roundtable). Participants were encouraged to switch tables throughout the day in order to engage with new stakeholders and to enliven the exchanges.

Participants asked many of the key questions facing today's mobility system. How safe is safe enough in autonomy? Who should be investing in connected infrastructure? What role should each stakeholder take in driving electrification forward? How can we develop an effective framework for sharing data that is essential both for safety and system efficiency? What are the different spectra that we should be considering in order to ensure equity within a mobility system that is very much in flux? The Mobility Initiative team successfully captured the many nuances of the rich discussions, collecting research ideas, questions, and needs.

The beauty is: you might think that nothing has changed, but things are constantly changing. [...] Things are always happening behind the scenes to transform infrastructure and the whole mobility system.

Over lunch on MMI Mobility Vision Day, Rafael Fernandez, Ferrovial's Innovation and Digital Strategy Director, discussed the value of collaborations between industry and academia: the value provided to academia through access to real-world problems and the value for industry as a result of outside-the-box innovation and methdological improvements spurred by academia.

Rafael Fernandez, Ferrovial's Innovation and Digital Strategy Director, speaks with John Moavenzadeh, Executive Director of the MIT Mobility Initiative during the November 16th Mobility Vision Day.

MMI: BY THE NUMBERS

131

Mobility Vision Day Attendees

7,000

Mobility Initiative Followers

34

Transportation Courses Offered

74

Mobility Initiative Events

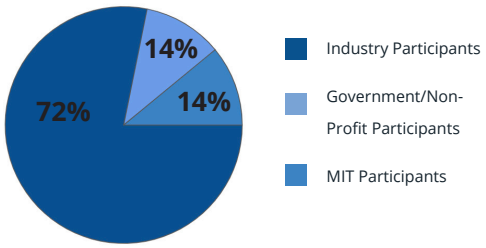
352

Published Papers by MMI Faculty Members in 2021

182

Average Mobility Forum Attendance

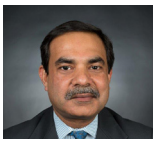
Mobility Vision Day was structured around participant discussions interspersed with expert panels. Attendees were encouraged to rotate tables throughout the day to engage with stakeholders from across the spectrum.



MOBILITY VISION DAY
SPEAKERS

MIT MOBILITY INITIATIVE: MOBILITY AS A SYSTEM CHALLENGE

Youngcho Chi
President & Chief Innovation Officer, Hyundai Motor Group



Shashi Verma
Chief Technology Officer, Transport for London

Erez Dagan
Executive Vice President, Mobileye

Andrés Sacristán
Chief Executive Officer, Cintra

Mary Culler
President, Ford Fund & Development Director, Michigan Central

AUTONOMOUS VEHICLES: SCALING ROBOTAXI DEPLOYMENT

Karl Iagnemma
President and Chief Executive Officer, Motional

Scott Griffith
Chief Executive Officer, Ford Autonomous Vehicles & Mobility

Jody Kelman
Head of Autonomous Platform, Lyft

CONNECTIVITY: SECURING THE QUEST FOR V2X

João Barros
Founder & Chief Executive Officer, Veniam

Dennis Ong
5G C-V2X Leader, Verizon

Raj Paul
Automotive Industry Leader, Microsoft

John Kwant
Global Director, Mobility & Advanced Technologies, Ford Motor Company

David Mindell
Professor of Aeronautics and Astronautics, MIT

ELECTRIFICATION: DRIVERS OF TRANSFORMATION

Alex Gruzen
Chief Executive Officer, WiTricity

Don Sadoway
Professor of Materials Chemistry, MIT

Matt Stover
Director Business Development, Team Edison, Ford Motor Company

Simon Lonsdale
Co-founder and Head of Strategy, Amply

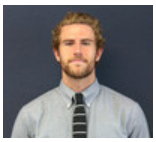
Andrew Wishnia
Assistant Deputy Secretary for Climate Policy, USDOT

TRUST DATA :: MOBILITY VISION

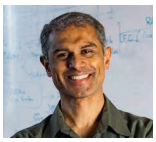
Kris Carter
Co-Chairman, Mayor's Office of New Urban Mechanics, City of Boston

Stephen Smyth
Co-founder & Chief Executive Officer, Coord

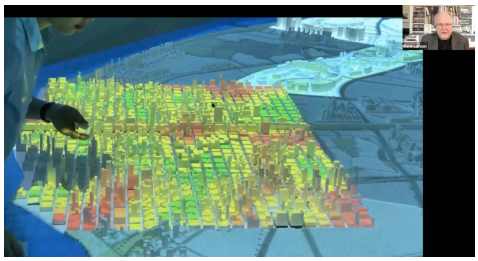
Regina Clewlow
Co-founder & Chief Executive Officer, Populus



Kerby Olsen
New Mobility Supervisor, City of Oakland



Hari Balakrishnan
Founder & Chief Technology Officer, Cambridge Mobile Telematics



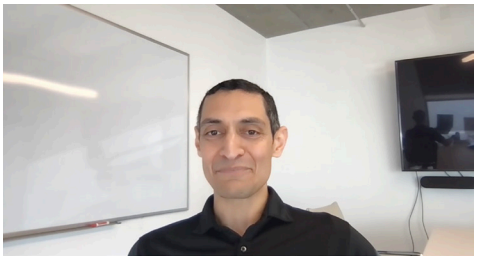
Kent Larson, Director of City Science research at the MIT Media Lab, presents his research on smart cities at the MMI Mobility Forum, Fall 2021

MOBILITY INITIATIVE
MOBILITY FORUM

The forefront of research

A weekly seminar series, the MIT Mobility Forum offers an opportunity to showcase the groundbreaking transportation research occuring across the Institute. Faculty members and researchers present their latest findings ideas, and innovations, followed by a lively discussion.

2021 saw a total of 26 Mobility Forum sessions across the Spring and Fall semesters. In early 2021, CTL Director Yossi Sheffi addressed the supply chain challenges presented by the COVID pandemic, Assistant Professor of Urban Planning Sarah Williams presented her team's work on twitter data aggregation for road safety improvements in Africa, and Sloan Professor David Keith discussed the value of owning a car, among others. The Fall Semester, meanwhile, saw an illustrious panel hosted by Professor Moshe Ben-Akiva presenting the latest research on autonomous vehicles, Electrical Engineering and Computer Science Professor Patrick Jaillet exploring how to incorporate uncertainty in transportation analyses, and Centre for Real Estate Professor Siqi Zheng discussing transit-oriented development trends around high-speed rail, and many more.



> For entrepreneurship, MIT teaches you not to be too scared. You go into a field where you honestly don't know that much and transform it. [...] You can turn it into an advantage if you move into a new space and look at it from a new perspective. As a newcomer, you arrive at an existing space and ask: what would be the ideal solution if you were to start from scratch?

Amply Co-Founder and President John De Souza '95 offers advice to students during the MMI Leadership in Mobility Innovation Series.

MOBILITY INITIATIVE
LEADERSHIP IN MOBILITY INNOVATION

Learning from the front lines

Every Fall, the Mobility Initiative hosts a series of dialogues between faculty members and entrepreneurs to offer insights into the diverse frameworks and opportunities for innovation within the field of mobility. Featured as part of the Mobility Ventures course, entrepreneurs share their personal journeys, advice, and insights into today's mobility system.

MOBILITY FORUM
SPEAKERS: FALL 2021

TOWARDS ZERO ENVIRONMENTAL IMPACT AVIATION

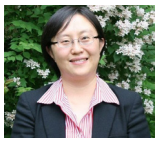
Steven Barrett
Associate Department Head of the Aeronautics and Astronautics Department and Director of the MIT Laboratory for Aviation and the Environment

RETHINKING TRAFFIC FLOW WITH CONNECTED AND AUTONOMOUS VEHICLES

Ennio Cascetta, Hani Mahmassani, Kaan Ozbay, Markos Papageorgiou, Steve Shladover and Moshe Ben-Akiva

PEDESTRIAN IMPACT ASSESSMENTS FOR URBAN DEVELOPMENT PROJECTS

Andres Sevtsuk
Charles and Ann Spaulding Career Development Associate Professor of Urban Science and Planning at the Department of Urban Studies and Planning



HIGH-SPEED RAIL, SUBWAY NETWORK AND URBAN VIBRANCY

Siqi Zheng
Samuel Tak Lee Associate Professor at MIT Department of Urban Studies and Planning, and Center for Real Estate

LEARNING RISK AND SOCIAL BEHAVIOR IN MIXED HUMAN-AUTONOMOUS VEHICLES SYSTEMS

Daniela Rus
Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science and Director of the Computer Science and Artificial Intelligence Laboratory

VALUE-SENSITIVE DESIGN IN MOBILITY: A CONVERSATION ON MOBILITY EQUITY

Stephen Zoepf & Sarah Thornton
Head of Policy, Ellis and Associates & Autonomy Systems Engineer, Nuro

OPTIMIZATION UNDER UNCERTAINTY FOR VARIOUS TRANSPORTATION PROBLEMS

Patrick Jaillet
Dugald C. Jackson Professor. Department of Electrical Engineering and Computer Science

DEEP NEURAL NETWORKS FOR CHOICE ANALYSIS

Shenhao Wang
Postdoctoral Associate, MIT Urban Mobility Lab and MIT Connection Science

APPLICATIONS OF MACHINE LEARNING FOR AVIATION COLLISION AVOIDANCE

James Kuchar
Assistant Head of the Homeland Protection and Air Traffic Control Division at MIT Lincoln Laboratory

TOWARDS ZERO-CARBON CITIES (KENDALL SQUARE AS A CASE STUDY)

Kent Larson
Director of the City Science research group at the MIT Media Lab

URBAN MOBILITY: USING MATHEMATICAL MODELS TO PREDICT WHERE AND HOW OFTEN WE GO

Carlo Ratti and Paolo Santi
Professor of Urban Technologies and Planning Director of the MIT Senseable City Lab & Principal Research Scientist at MIT Senseable City Lab

UNDERSTANDING AND IMPROVING TRANSPORTATION SYSTEMS

Tom Magnanti
Institute Professor and a Professor of Operations Research

MOBILITY FORUM
SPEAKERS: SPRING 2021

INCENTIVIZE SAFE DRIVING: A RCT WITH BEHAVIORAL INFORMATION

Chris Knittel
George P. Shultz Professor of Applied Economics

MIXED AUTONOMY TRAFFIC: A REINFORCEMENT LEARNING PERSPECTIVE

Cathy Wu
Gilbert W. Winslow Career Development Assistant Professor, Civil and Environmental Enginerring

NAVIGATING THE NEW TRANSPORTATION DEMANDS OF AN AGING SOCIETY

Joe Coughlin
Founder and Director, MIT AgeLab

CROWDSOURCING THE MISSING CRASH DATA

Sarah Williams
Associate Professor of Technology and Urban Planning; Chair, Urban Science & Computer Science Program

TRANSIT-CENTRIC MULTIMODAL SYSTEM DESIGN

Jinhua Zhao
Director, MIT Transit Lab; Director, MIT Mobility Initiative; Associate Professor of City and Transportation Planning

SUPPLY CHAIN MANAGEMENT BEYOND COVID-19

Yossi Sheffi
Elisha Gray II Professor of Engineering Systems

ONLINE-RETAILING AND TRANSPORTATION SYSTEMS

Steve Graves
Abraham J. Siegal Professor of Management, Sloan School of Management

TRI-POP, AN ONLINE PREDICTION, OPTIMIZATION AND

Moshe Ben-Akiva
Edmund K. Turner Professor in Civil and Environmental Engineering

CYBERSECURITY AND THE FUTURE OF TRANSPORTATION

Sanjay Sarma
Vice President for Open Learning and Fred Fort Flowers and Daniel Fort Flowers Professor of Mechanical Engineering

CALCULATING THE VALUE OF CAR OWNERSHIP

David Keith
Assistant Professor of System Dynamics at the MIT Sloan School of Management

RESEARCH TRENDS IN TRANSPORTATION: A CONVERSATION WITH THE EDITOR OF TRANSPORTATION RESEARCH PART B

Chandra Bhat
Editor, Transportation Research Part B; Director, US DOT Center on Data-Supported Transportation Operations and Planning (D-STOP)

A NEW APPROACH FOR VEHICLE ROUTING WITH STOCHASTIC DEMAND: COMBINING ROUTE ASSIGNMENT WITH PROCESS FLEXIBILITY

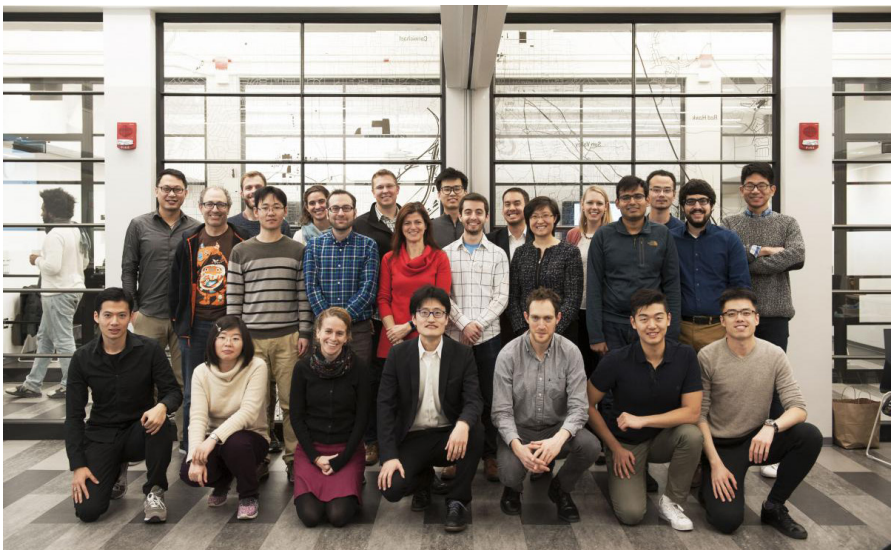
David Simchi-Levi
Professor of Civil and Environmental Engineering and Director, MIT Data Science Lab

RESEARCH TRENDS IN TRANSPORTATION: A CONVERSATION WITH THE EDITORS OF TRANSPORTATION RESEARCH PART A

Elisabetta Cherchi
Co-Editor in Chief Transportation Research Part A: Policy and Practice; Professor of Transport, Newcastle University, UK

RHYTHMIC TRAFFIC MANAGEMENT AND CONTROL IN A FULLY AUTOMATED VEHICLE ENVIRONMENT

Yafeng Yin
Professor and Associate Department Chair of Graduate Programs, Department of Civil and Environmental Engineering, University of Michigan



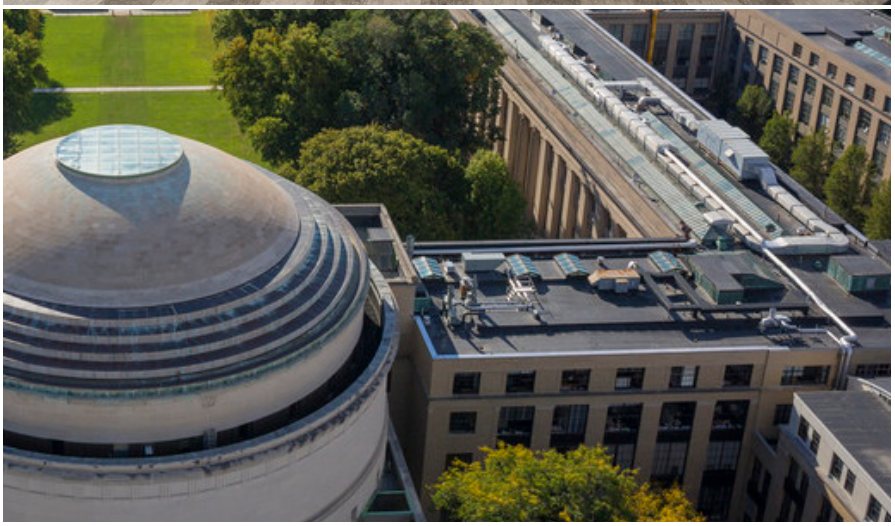


Photo top

Gradute students, research scientists, and faculty members from MIT's Urban Mobility Lab.

Photo bottom

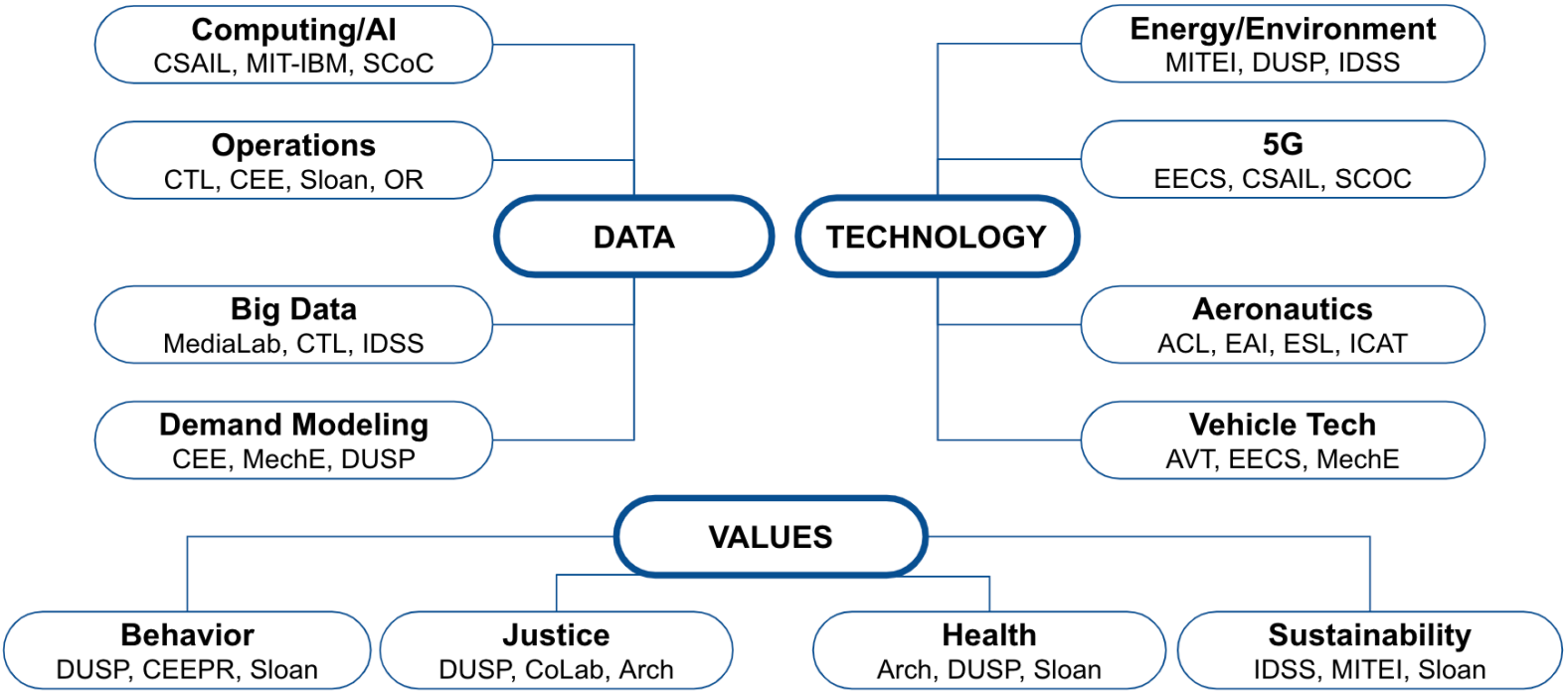
Aerial view of Building 10 and adjoining buildings on MIT's Cambridge, MA campus.

MOBILITY INITIATIVE **RESEARCH**

Groundbreaking mobility insights

MIT has a rich array of on-going research in the mobility space. MIT Mobility Initiative faculty members hail from departments as diverse as Electrical Engineering and Computer Science, Chemical Engineering, the Sloan School of Business, Civil and Environmental Engineering, Urban Planning, and more. The Mobility Initiative is a central node for exchange and access to MMI faculty members' research, as well as an independent hub for cross-disciplinary research through its research consortia.

MMI RESEARCH FRAMEWORK MAPPED TO MIT SCHOOLS, DEPARTMENTS & LABS



AVT: Advanced Vehicle Technology Consortium; CEE: Civil and Environmental Engineering; CSAIL: Computer Science & Artificial Intelligence Laboratory; CTL: Center for Transportation and Logistics; DUSP: Department of Urban Studies and Planning; EECS: Electrical Engineering & Computer Science; MechE: Mechanical Engineering; OR: Operations Research; SCoC: Schwarzman College of Computing; IDSS: Institute for Data, Systems, and Society; ACL: Aerospace Controls Laboratory.

MMI RESEARCH CONSORTIA

Cross-disciplinary research

Research Consortia are the core of the MIT Mobility Initiative. Research Consortia gather public and private stakeholders from across the globe to conduct research on the most pressing and relevant topics within mobility. The output of the roundtables is used to guide policy, shape standards, coordinate across actors, and, ultimately, accelerate the transformation towards a safe, clean and inclusive mobility system.

Research Consortia offer a unique opportunity for coordination across diverse stakeholders (from multiple industries, academia, and governments) to better chart a path forward in the new world of mobility. Research Consortia support a portfolio of research projects that can help us better understand today's trends and offer new and innovative ways to shape the future.

In addition to rich discussions among and between participants, there are two types of products produced by Research Consortia: **Primary Research Projects** submitted and conducted by MIT faculty faculty members and **Research Briefings** presenting in-depth overviews of selected topics, including technologies or methodologies related to that topic; insights into the various theories or approaches pertinent to that topic; and recommended areas for future research.

FACULTY RESEARCH

On-going knowledge development

MMI Faculty Members conduct research across a wide array of fields ranging from urban planning to machine learning to operations research and beyond. MMI is the central location to keep a finger on the pulse of all groundbreaking mobility-related projects, ideas & innovations at the Institute.

The above graphic conveys the rich array of on-going research at the Institute. An inherently cross-disciplinary subject matter, transportation touches on many traditional discplines. Ongoing research can be placed into three overarching buckets that together enable a systems approach to mobility: data (exploring modeling, optimization, artificial intelligence & machine learning), technology (developing sensors, batteries, 5G, and more) and values (examining behavior, health, equity, and sustainability).

The MMI is at the center of aggregating this on-going research by approaching the analysis of key areas with a systems lens. MIT has long thrived as an epicenter of systems analysis--a methdology that is particular pertinent for the complexity of today's mobility system in order to develop a comprehensive understanding that can lead to the design of safe, clean, inclusive, efficient & robust systems and networks.

RESEARCH SPOTLIGHT
AUTONOMOUS AND CONNECTED RESEARCH CONSORTIUM

The future of transportation

FEATURED FACULTY

PROF. SANJAY E. SARMA
Vice President for Open Learning and Fred Fort Flowers and Daniel Fort Flowers Professor of Mechanical Engineering

PROF. DANIELA RUS
Director, MIT CSAIL and Andrew and Erna Viterbi Professor of Electrical Engineering and Computer Science

PROF. JINHUA ZHAO
Director, MIT Mobility Initiative and Associate Professor of City and Transportation Planning

MISSION
To bring together public & private sector stakeholders for the development & deployment of secure and safe mobility systems with AV and V2X technologies.

AREAS OF FOCUS

Safety & Performance
The IEEE 2846 standard introduces a framework for not just measuring, but evaluating acceptable risk for autonomous vehicles. What strategies and methodologies can be developed to measure residual risk and define residual risk tolerance across all stakeholders? What are the impacts of different risk tolerance levels on performance, specifically congestion and emissions? How do these metrics change by climate, city topography, use case, etc?

Connected Infrastructure
How can we ensure the cybersecurity of connected infrastructure at the intersection of the physical and digital realms? What are the implications for the role that connected infrastructure might play in mixed fleets? What connected infrastructure is necessary to support autonomous fleets and integrate them with other transportation purposes and modes: micromobility, human-driven cars, active transportation/pedestrians/bikes, other vulnerable road users, etc.?

Consumer Acceptance
How are consumers likely to adopt autonomous vehicles? What is the difference between the actual safety and the perceived safety of autonomous vehicles? How are the risks and benefits of autonomous vehicles perceived by consumers? Focus areas include AV business model comparisons and/or pedestrian movements.

MOBILITY INITIATIVE
EDUCATION

Educating the leaders of tomorrow's transportation system

2021 brought with it exciting updates to MIT's graduate programs in transportation, including new coursework and revised program requirements to better fit the changing demands of careers in transportation as well as the program's largest applicant pool to date.

Led by MIT's Mobility Initiative, the Institute's cross-disciplinary gradute program in transportation provides a variety of graduate degrees for students interested in transportation studies and research. Students choose from a wide range of introductory and advanced subjects related to transportation and engage with real-world projects and challenges resulting in an education that prepares them to be the leaders of tomorrow's transportation system.

MIT offers over 30 courses related to transportation across a wide array of disciplines, including computer science, operations research, civil engineering, urban planning, and more. 2021 saw the introduction of new coursework to address the changes in today's transportation system, including Mobility Ventures, Decarbonizing Urban Mobility, and Entrepreneurship in Aerospace and Mobility Systems.

Mobility Ventures explores technological, behavioral, policy and systems-wide frameworks for innovation in transportation systems, complemented with case studies across the mobility spectrum, from autonomous vehicles to urban air mobility to last-mile sidewalk robots. **Decarbonizing Urban Mobility** focuses on measuring and reducing emissions from passenger transportation including reviewing existing approaches to transport decarbonization and evaluating new mobility technologies through their potential to contribute to (or delay) a zero emission mobility system. And **Entrepreneurship in Aerospace and Mobility Systems** examines concepts and procedures for new venture creation in aerospace and mobility systems, and other arenas where safety, regulation, and infrastructure are significant components.

The applicant pool for the 2022/2023 academic year was the largest one to date, underscoring the growing importance of the field of transportation and the value of our emphasis placed on cross-disciplinary education. Program requirements have been updated to reflect the diverse array of students engaged in the program. Masters students are required to learn foundational skills and take courses in analytics & computation and policy, technology, and society.

As deep neural networks (DNNs) outperform classical discrete choice models in many empirical studies, one pressing question is how to reconcile them in the context of choice analysis.

Dr. Shenhao Wang was awarded the 2021 Dan and Eva Roos Thesis Prize as awarded to an outstanding MIT PhD thesis in the field of transportation. Dr. Wang's dissertation examined deep neural networks for choice analysis.

Dr. Arthur Delarue and Dr. Wilko Schwarting received honorary mentions for the award.

Eva and Dan Roos present the Dan and Eva Roos Thesis Prize to Dr. Shenhao Wang during the 2021 Mobility Forum series.

SPOTLIGHT
STUDENTS

Educating the leaders of tomorrow's transportation system

Nick Caros

Nick Caros is a third year PhD candidate in the Transportation program at MIT. His research is focused around the implications of widespread remote work for urban mobility. He designs new methodological tools and prepares policy recommendations to enable transportation providers to adapt to remote work and ultimately promote a more sustainable urban future. He works on sponsored research projects in collaboration with the transit agencies in Boston (MBTA) and Washington DC (WMATA) as well as the MIT Energy Initiative. Nick holds engineering degrees from the University of British Columbia and New York University, and previously worked as a transportation planner in New York City.

Devin Wilkins

Devin Wilkins is a first-year Masters student in the transportation program at MIT, supervised by Prof. Jinhua Zhao. Her current research focuses on commuter rail service planning in the aftershocks of the COVID-19 pandemic. This work involves forecasting ridership in future years considering factors like behavioral shifts towards working from home, the impending reconstruction of Boston's I-90, and overall economic trends in the region. She completed her Bachelor's degrees in Civil Engineering and Studio Art at the University of Texas in 2020.

Baichuan Mo

Baichuan Mo is currently a fourth-year Ph.D. candidate in the transportation program at MIT. His research focuses on the resilience of public transit systems. Specifically, he aims to understand the theoretical and practical impacts of unplanned service disruptions on public transit systems, and to design efficient control strategies using machine learning and optimization methods to mitigate negative impacts of unplanned incidents. He completed his dual Master's degree in Transportation and Computer Science at MIT in 2020.

Angi Acocella

Angi Acocella recently defended her PhD at MIT's Center for Transportation & Logistics. Her research focuses on improving the strategic decisions made in long-haul freight transportation. Using large-scale industry data, she builds freight pricing and behavioral models that incorporate multiple sources of real-world uncertainties. Angi works closely with industry partners to develop her research and implement her work into their processes. She received the 2020 UPS Doctoral Fellowship and has presented her research at academic and industry conferences as well as has published in leading academic journals. Angi holds an MSc from the Technology and Policy Program at MIT and a BSc in Mechanical Engineering from Rensselaer Polytechnic Institute.

MOBILITY INITIATIVE
ENTREPRENEURSHIP

Driving innovation & change in the field of mobility

Innovation has existed in the genes of MIT since its very founding and is one of the core pillars of the MIT Mobility Initiative. 2021 saw engagement with a wide array of entrepreneurs, new coursework related to entrepreneurship, and mentorship of early stage mobility innovators across the Institute.

As one of the nation's first land-grant colleges, MIT was designed to deliver a practical education—one that emphasizes learning by doing and prioritizes developing solutions to complex (yet invariably compelling) problems. The MIT Mobility Initiative has internalized this ethos, emphasizing innovation and real-world implementation as part of its educational programs and ecosystem engagement: over 15 start-ups participated in November's Mobility Vision Day and the Initiative's Leaders in Innovation Series featured 10+ entrepreneurs from companies ranging from Sidewalk Labs to Optimus Ride to Spin.

The Mobility Initiative partners with a wide array of entities across MIT's existing robust entrepreneurial ecosystem to help support mobility-specific innovation.

Mobility is one of today's most exciting fields for entrepreneurs. From technology to new business models, there is a large appetitite for disruption across the world of mobility.

Bill Aulet, Director of the Trust Center for Entrepreneurship, co-instructs Mobility Ventures, a course that gives students from a wide array of disciplines the tools to identify core gaps in the mobility system and to develop business plans for how to fill them.

PARTNERS

designx

A unique initiative that involves academic courses, data-informed research, and an entrepreneurship program, **DesignX** supports innovation that aims to transform cities and the built environment.

The **Martin Trust Center** supports students with an entrepreneurship curriculum, programming, coaching and mentoring from connections in the broader entrepreneurial MIT communities.

MIT innovation initiative

The Innovation Initiative works to combine opportunities for hands-on innovation and entrepreneurship education at MIT, building a dynamic innovation infrastructure across Schools and disciplines.

MOBILITY INITIATIVE
CIVIC ENGAGEMENT

Building a better world

Partnerships with public sector and non-profit stakeholders to help effect real-world impact lie at the core of the Mobility Initiative. MMI undertook an array of high impact projects in 2021 on topics ranging from electric vehicle charging to the supply chain crisis to mobility equity to transit ridership predictions.

At the Mobility Initiative, we work to offer cutting edge analysis, research, and innovation in service to society. This involves working with governments, organizations, and students to build a better world through social, environmental, and technological change. As part of that mission, the Mobility Initiative engages with cities and communities to better understand their challenges and to offer platforms and solutions to address their needs.

In early 2021, the Mobility Initiative launched a series of Infrastructure Bill Task Forces designed to offer the expertise of MIT faculty members in service of structuring the different components of the United States Infrastructure Bill. The **electric vehicle charging task force** aggregated faculty insights and recommendations around the implementation of a charging network along highway corridors, while the **transportation equity task force** provided comments for how best to approach data to ensure transportation equity.

The **supply chain crisis**, meanwhile, was accompanied by a wide array of logistical challenges. At the height of the crisis, the MIT Mobility Initiative partnered with the White House National Economic Council to aggregate faculty insights and methodologies for addressing the shortages. The recommendations shared ranged from improving supply chain visibility to applying optimization to improve overall system efficiency.

In response to the myriad challenges facing public transit agencies, MMI partnered with the Chicago Transit Authority to structure an **exchange across the largest US transit agencies to share best practices for ridership and revenue projection building** in the face of ongoing uncertainties. The MMI team analyzed existing scenarios, aggregated insights, and structured several exchanges among groups of agencies.

2021 also saw the first annual MMI **Mobility Equity Symposium**, supported by the Sasaki and Barr Foundations. The event elevated voices from the communities of Lynn and Malden to share the transportation-related challenges that they are facing and challenged participants to listen and collaborate to develop a rseearch agenda around equity going forward.

Electric Vehicle Charging Task Force

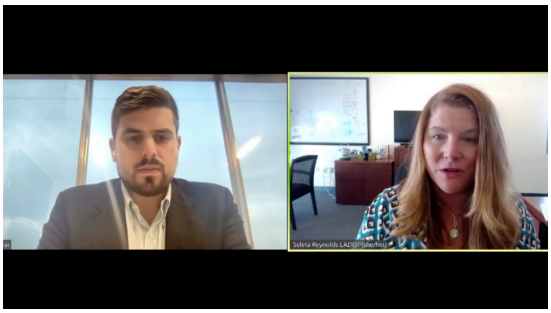
In early 2021, the Mobility Initiative launched its Electric Vehicle (EV) Charging Task Force to amass methodological and topical insights for how the federal Infrastructure Bill should approach funding and parameters for EV charging. The MMI worked closely with a group of faculty experts to collect pertinent ideas and insights and to provide recommendations.

MORE 2022
HIGHLIGHTS

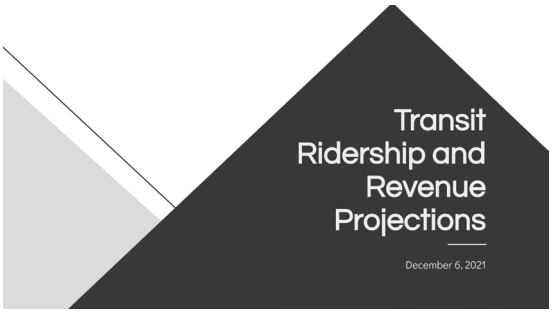
Photos from left to right, top to bottom:

Mobility Vision Day participants discuss potential roles for autonomous vehicles.

John Casesa, Senior Managing Director at Guggenheim Partners, offers insights to Mobility Ventures students.

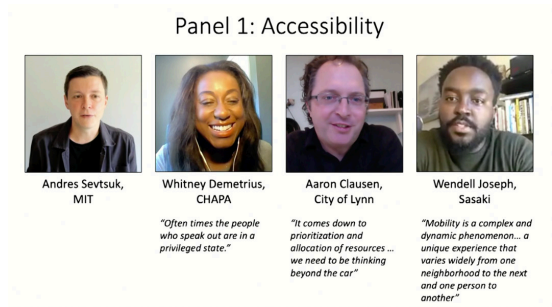


Spin CEO Ben Bear and LADOT General Manager Seleta Reynolds discuss Universal Basic Mobility.



Presentation on best practices for revenue & ridership projections delivered to US transit agencies.

Mike Whitaker, Supernal's COO, discusses the future of aviation with students in Mobility Ventures.



Overview of the speakers on the first panel for the first annual Mobility Equity Symposium. June 2021.

MOBILITY INITIATIVE **TEAM**

Faculty & leadership

MMI FACULTY

Overview

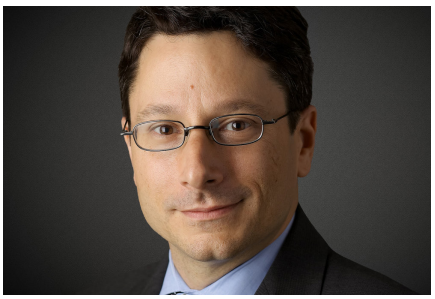
The Mobility Initiative includes over 70 faculty members and researchers from across the Institute. Faculty members engage in activities across all four Mobility Initiative pillars, including research, education, entrepreneurship, and civic engagement. More details about MMI faculty can be found at mmi.mit.edu/mi-people.

MMI LEADERSHIP

JINHUA ZHAO

Faculty Director

Jinhua is Associate Professor of City and Transportation Planning at MIT and Director of the MIT Mobility Initiative. He brings behavioral science and transportation technology together to shape travel behavior, design mobility system, and reform urban policies, developing methods to sense, predict, nudge, and regulate travel behavior



JOHN MOAVENZADEH

Executive Director

John is Executive Director of the MIT Mobility Initiative, where he developed and co-teaches the graduate-level Mobility Ventures course. John is also Founder and Managing Partner at Mobility Nexus LLC, Operator Advisor at Assembly Ventures, and serves as an independent advisor to several companies leading the transformation of transportation.

ANNE HUDSON

Assistant Director

Annie is the Assistant Director of the MIT Mobility Initiative and a researcher with MIT's Urban Mobility Lab. Her research focuses on preparing cities for next-generation transportation technologies and conducting systems analyses for transportation infrastructure development. Prior to MIT she worked for many years as an energy analyst.

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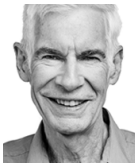

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